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THE MEDICAL SCHOOL AS PART OF THE UNIVERSITY¹

IN our educational systems, as in most of the complex institutions of human origin, the changes that are constantly occurring do not seem to follow a course of continuous symmetrical development. The manner of growth appears to resemble rather that process of exuviation with which we have been made familiar in the life history of the humble crab and his crustacean relatives. That is to say, at certain more or less regular periods our systems become enveloped in a case of customs and traditions of shelly consistency, which, while it serves as a protection toward dangers from without, afflicts grievously by and by the growing parts within. In the end the increasing pressure becomes distressing or painful and the only way out of the predicament is to moult the old shell and grow as fast as possible before a new one takes its place. The system of education in medicine has in fact been undergoing a moult for some years past and what I have in mind to-day is to call attention to the fact, perhaps already sufficiently obvious, that the process is not entirely completed. While certain parts of the system are free from the old constricting influences and are at liberty to grow and expand in proportion to the measure of vitality with which they are endowed, other parts are still encased in ancient shell which serves as an obstacle to their proper development.

During the last twenty years especially medical education and the condition of medicine in general in this country have been the subjects of much earnest discussion. Critics within and without the pro-

¹ Annual address in Medicine, Yale University.

fession have exposed its weaknesses in the merciless way appropriate to their rôle, and reformers have cried aloud its deficiencies from the house-tops. One naturally inquires what is the cause of all this stir? What has happened to create such dissatisfaction with a system that formerly was accepted without comment? The ills and accidents which afflict mankind are not greater or more numerous than in former times. The pestilence still walks in darkness and destruction wastes at noonday as of old, but not more so. Indeed we flatter ourselves that we are better off than our ancestors in these regards. But we take a different attitude toward them. Our forefathers did what they could to escape these ills and in biblical phrase sought to their physicians with more or less satisfactory results. But what they could not avoid or prevent they accepted submissively as an act of God, a phrase which some one has defined in comprehensive manner as including all those acts which no reasonable man can foresee. In these latter days, on the contrary, there is a wide-spread feeling that man should be able to apply his intelligence so as to reach a more satisfactory understanding and control of disease and pestilence. The reason for this change of attitude toward nature is to be found, without doubt, in the great increase in our scientific knowledge. Physics, chemistry and biology have added immensely to our comprehension of the processes of nature, living as well as dead, and this acquisition has awakened in us a keen desire to apply all this knowledge practically in saving ourselves as far as may be from sickness and death. If we can find out the secrets of the stars and bend the forces of nature to our use and pleasure, can we not also unravel to some extent those mysteries of life and death which after all are the phenomena of paramount importance to us in

this universe in which we find ourselves placed. This same desire to apply scientific knowledge to practical medicine was apparent in Europe early in the nineteenth century. Investigations of the laws controlling inanimate nature had spread rapidly to a similar study of the properties of living matter, although the transition was attended by some convulsive qualms among the timid and superstitious. Foolish and ineffectual attempts were made to discourage the bold pioneers by charges of impiety or by predictions of the necessary futility of all efforts to solve such great mysteries. In medicine, especially, this kind of opposition was very common, and the enlightened members of the profession contended against many unnecessary difficulties in their efforts to introduce the methods and results of science into the practise of medicine. Our own country was very slow in feeling the effect of this movement. We are all aware that medical education and therefore medical practise in this country, speaking in general terms, were until recent years far below the standard maintained in Europe. Conditions among us, in fact, were such that for a time things went from bad to worse. Our curve of efficiency kept falling, while in other civilized lands it rose more or less parallel with the growth in scientific knowledge. There thus came to us a certain distinct and admitted inferiority in medical matters which has not yet been fully overcome. Many excuses and reasons might be offered for the backwardness of our development in medicine, but the excuse most frequently made was and is that our growing country has need in the outlying districts for an inferior type of physician willing to work hard for little pay, and consequently entitled to receive his degree in medicine at little expense of time or money. A need of this kind undoubtedly existed, but it scarcely justified

the creation of the numerous poor schools with which this country was afflicted, and whose ill-prepared graduates practised in the centers of population as well as in the outposts of civilization. One can not entirely suppress the suspicion that motives of personal gain and commercial expediency were largely responsible for the deplorable condition that prevailed in the latter half of the nineteenth century. A few schools possessed of good traditions made an earnest fight for better things under very adverse circumstances, and we must recognize that among the graduates of the poorer schools there were some who became able and even famous practitioners. I venture to believe that this latter result was in no way due to the system, but is to be explained by the fact that the profession of medicine will always draw to itself a considerable number of able and high-minded men, who are bound to make themselves felt upon whatever system their education may be conducted. But the general output of medical graduates was for a time far inferior in quality to that supplied to other nations. What else could be expected from a system which permitted, indeed actively encouraged, men to enter the medical school without any previous education and then qualified them to practise upon the public after a bare ten or twelve months' study of the science and art of medicine? It was much easier at one time to enter the profession of medicine than to become a recognized journeyman in a trade. The conditions indeed became bad enough to call urgently for reform, and this call has grown increasingly imperative down to the present day. In a democratic country like ours a reform in a system of education is naturally a slow process. Under a more centralized form of government it is only necessary to convince the few who have authority and the desired reform may be

inaugurated promptly and effectively. But with us it is requisite to arouse the people at large. If an improvement is called for it can only be established permanently by creating an enlightened public opinion in its favor. It happens therefore in medicine as in politics that the country gets about the kind of service that the majority thinks it wants, and progressive leaders have a very hard time in making that majority change its ideas. Certainly in medicine the effort for reform has been a long and laborious one, but we may feel sure that now the tide of public opinion has turned in favor of a better system. A necessary preliminary step was the development of an appreciation of science in this country. Fortunately our colleges and universities have made splendid progress in this respect. They have created a scientific atmosphere, they have let loose among us a scientific spirit which has entered like a ferment into the medical schools. There, like a ferment, it has caused much commotion and unrest of a healthy and normal kind, the end-result of which will be no doubt the establishment of a system of medical training as good at least as that found in other countries of the same grade of civilization. It may be interesting to inquire how far we have advanced toward this desirable end; and in what direction our present tendencies are taking us. The positive results of the agitation begun during the present generation are important and satisfactory. Our schools, if we take them all into account, are still so heterogeneous that it is scarcely possible to make any general statements that shall be equally applicable to all, but we have an increasing number of strong schools which are setting the pace for the rest, and those that can not keep up will have to drop out of the race altogether. According to reports thirty schools surrendered to this fate

during the past five years. The better schools, which we need alone consider in this matter of the status of our development, are organized, almost without exception, as the medical department of a university. Herein lies the secret of their success and the promise of their improvement in the future. In these schools there is firmly established a four years' graded course, of which the first two years are devoted largely to the preparatory medical sciences of anatomy, physiology and pathology, using these terms in their broad sense to include such subjects as histology, physiological chemistry, pharmacology, etc. The most significant fact, however, is that these preparatory sciences are taught by specialists who give their entire time to the work, and whose methods and ideals differ in no essential respect from those followed by teachers of physics, chemistry and biology. In other words, the instruction in these medical sciences has been raised to the university level, as has been the case now for so many years in the German schools. The change in the character of the instruction in these subjects has brought it about that in many of our colleges and universities they are accepted as appropriate courses for academic degrees, a recognition which I believe will soon become general. For when properly taught a course in anatomy, physiology or pathology gives a liberal education and a mental training which are of value to any man, whatever may be his career in after-life. These subjects deal with the great problems of existence, the riddles of life and death and propagation, and all the properties of that extraordinary substance which we call living matter; they throw light not only on the special questions that interest the physician, but they furnish also valuable material for the practical use of the sociologist, the political scientist, the phi-

lanthropist and the statesman. Moreover, they bring us close to the highest and most difficult subject that the human mind is called upon to contemplate, that is to say, the relationship between ourselves and the material universe, the ever-fascinating and mysterious interdependence of mind and matter. Much has been said upon the subject of the cultural value of liberal studies as opposed to so-called professional or technical studies, but in all discussions of this kind there is a tendency toward a certain arbitrary assumption that courses of studies must fall wholly under one or the other of these rubrics, whereas common experience teaches us that merely putting a label upon a thing is no guaranty that the contents are thereby properly described. The preparatory training for life should be liberal and humanizing, but it is quite possible that many different lines of study may lend themselves with equal success to the development of these qualities, and it will be admitted perhaps by every one that the courses of study in college, in addition to having a broadening influence upon the student, should also inculcate in him some specific kind of mental training which will fit him better to take a high rank in whatever career he may happen to select.

The term technical, as applied to courses of instruction, has acquired an unfortunate connotation which implies that they are lacking in value from the standpoint of general training. As a matter of fact, many of the graduate courses given in our universities are quite as technical as those given in the preparatory sciences in the medical school, and for one as for the other it is short-sighted to assume that they are devoid of a general educational value. I prefer much the definition of the term technical which has been given by Professor Karl Pearson. He makes a distinction between technical and professional instruc-

tion, or, to use his precise terms, between technical education and professional instruction. Under the latter term he includes training in the art of a specific profession—that kind of training which the apprentice gets from his master in the specialized methods and handicraft peculiar to the vocation—the kind of training which, in the case of the physician, is obtained in the wards and clinics in contact with patients. By technical education, on the other hand, he means that training in the underlying subjects of a profession which makes for the development and strengthening of the mental faculties. The technical education of the physician in this sense lies in the physical and natural sciences, including under the latter term the whole range of the biological sciences. Whether any given course in this category meets Pearson's definition of technical education is determined by asking whether it "provides mental training for the man who has no intention of professional pursuits." Judged by this standard, we may understand that it is the method in which a science is taught as much as its contents which determines whether or not it has value as an intellectual preparation for life. I have no doubt that various subjects, scientific or otherwise, are taught at times within the walls of the universities in such a way that they miss the larger end and confer only the restricted benefit of a special knowledge which is truly professional for that subject. There can be, however, no hesitation in claiming that the subjects of anatomy, physiology and pathology as they are taught or should be taught in our best medical schools are adapted to give a training to the mind as broadening and as generally beneficial as courses in physics, chemistry, biology or indeed as any of our university courses which deal with special departments of human knowledge.

So far as graduate instruction is concerned this contention has long been admitted in this country, and the subjects we are considering are listed upon the programs of study in both the philosophical and the medical faculties. In later years many colleges have gone a step farther and have accepted these courses as part of a general scientific training for those students who are looking forward to a career in medicine. It is perhaps only a matter of a little time before they will be admitted to the same standing in all respects as the other sciences, that is to say they will be considered not only as subjects of special medical interest, but as conveying knowledge of the widest human interest and importance. So far as the subjects themselves are concerned they enjoy their widest opportunity and best environment when the medical school forms an integral part of the university, not only in organization, but in location as well. If it so happens that geographically the medical school is separated from the rest of the university it is not a matter of vital importance, so far as I can see, in which set of buildings these subjects are taught, provided only the teachers are of the right sort. This opinion, I am glad to say, is merely by way of confirmation of the practise that is actually coming to be established among us. When these subjects are segregated with the clinical branches something, no doubt, of the university atmosphere is lacking; when they are separated from the clinical side there is a corresponding loss of medical atmosphere. Which is the more serious loss, or whether there is any material difference in the final result, it is difficult to say. The medical student probably values more highly the medical surroundings. They give significance to the things that he is learning and in various informal ways they furnish him with op-

portunities to acquire the points of view and the methods of practical medicine. On the other hand, they have the disadvantage of distracting and diverting some students from a thorough study of the preparatory sciences. I have had frequent occasion to observe this effect. Some of our medical students chafe under this prolonged preparation, forgetting the fact that it is an opportunity which may never come to them again, and forgetting also that it gives them the badge, the impress that will differentiate them from the mere empiric, when the time comes for them to compete with their fellow practitioners. To the teachers, on the contrary, particularly if they belong to the productive type, the university atmosphere is perhaps more stimulating. The methods and ideals of these teachers are more closely related to those of the university professors than to those of their clinical colleagues. For while research is valued as much perhaps in the medical department as in the philosophical department, there is the difference that in medical circles the reward of immediate appreciation goes chiefly to those investigations that promise to have a direct practical application. The medical atmosphere encourages research by the sharp stimulus of an abundant reward for practical results. The university spirit or the academic spirit, on the other hand, takes the wider and wiser view that looks beyond the immediately useful to the large results that may be expected from a growth of knowledge in general. This serener atmosphere forms a grateful environment for research, and in the long run no doubt it produces the larger harvest of useful knowledge. Investigation after all is always a voluntary offering. There is no way of compelling it or of estimating its value in terms of time or quantity, and men who investigate do not like to be put under the pressure of

demonstrating that the work they do is of immediate importance to mankind. They prefer to study those problems which for one reason or another have aroused their interest. Considering the complexity of nature, especially the living side of nature, and remembering how difficult, even dangerous, it is to apply knowledge that is incomplete, the rest of mankind would do well to encourage in every way the little band of investigators whose chief ambition and pleasure in life is simply to add to our store of knowledge. As a matter of fact mankind generally does not place a very high estimate on the work of these disinterested individuals whose labors contribute to the common good rather than to personal gain, although history teaches us in an infinite number of ways that on the work of such men depends in large measure the possibility of progress. Perhaps the explanation lies in the fact that the good these men do comes after them, it benefits posterity rather than the present generation, and we are inclined to let posterity do the appreciating as well as the benefiting. But this is a line of thought aside from our present purpose. The conclusion that I wish to emphasize is simply that all the agitation that has been going on in medical circles during the past two decades has resulted finally in the establishment of two reforms in medical education. First, the preliminary training for entrance upon the medical career has been greatly increased. Starting with practically nothing at all, it was raised first to a common-school education, then to a high-school education and finally, in the university schools, to a college preparation, partial or complete. Second, in the medical course itself the work of the first two years has been so arranged that it continues the traditions and methods of the university in the study of the so-called underlying

medical sciences. It will be observed that these two important results have to do with the preparation for practical medical work. On the old system two years were given to acquiring a sufficient knowledge of the art of medicine. As scientific knowledge increased and penetrated into medicine the period of instruction was prolonged to four years, or taking into account all of the necessary preparation, to six or eight years, but all of this additional time was devoted substantially to preliminary or preparatory training. This is a significant fact. All of the truly art side of medicine or of any other profession may be acquired on the apprenticeship system, without any previous preparation other than is implied in a basis of general intelligence. It is the scientific side of medicine which calls for all of this extensive preliminary training. Without it one might still in a two years' course make a capable practitioner, to use a distinction made long ago by Magendie, but not a scientific physician. The difference between an able practitioner and a scientifically trained physician is not so striking that it can be appreciated at once by the public at large. The difference is there, however, and eventually it means everything to the advancement of medicine to recognize this difference and to increase it by every means at our command, whatever cost of time and money it may entail. Excellence is generally the thing that costs. If by the expenditure of more money we can add a knot or two to the speed of our steamships we know that it pays us to do so, and if by longer and more expensive training the efficiency of the physician may be increased a little, the difference is worth the cost, for it also will add much to the happiness and prosperity of the whole community.

The content of the curriculum of our first two years, and the character of the

instruction given during that period, may be modified more or less from time to time. It may be expanded or more probably it may be simplified, but it seems to me that our system of medical instruction in this country is committed definitively to the general principle that these medical sciences shall be taught as the other sciences in the university are taught, by specialists who give their entire time to the work and who are active in research as well as in instruction. The force of successful example will compel all schools to follow this type. But, we may ask, is there no change that is desirable in the system of instruction in the clinical branches? This is a question which ought to be discussed by clinicians as by those who know whereof they speak. But it is a general truth, perhaps, that reforms in teaching do not usually originate from those occupying the positions in which changes are called for. Feelings of personal interest or loyalty to traditions prevent them from seeing clearly the defects that may be obvious to others. It comes about, therefore, that the initial impulse to reform is often forced upon us by criticism from without. In regard to the teaching of the clinical subjects in our medical schools three general changes have been suggested at one time or another and are likely to come up for serious consideration in the immediate future. First, shall the time devoted to these subjects, under the auspices of the medical school, be lengthened? At present the usual plan is to give two years to this side, and the definite suggestion made is that a third, exclusively hospital year, shall be added. I shall not stop to discuss this question. Our graduates themselves realize the value of this additional experience and in increasing numbers every year they are seeking a term of service in the hospitals before entering upon private practise. It seems to

me most probable that we shall find it advantageous to follow in this respect the example set for us by the older countries, that is to add a year of hospital service as an obligatory part of the requirements for the degree in medicine or for the license to practise medicine. As we all know, this change has been strongly recommended by the council on education of the American Medical Association. Second, there is much complaint from many sources, particularly from the teachers of the medical sciences, that the professors of the clinical subjects do not make adequate use of the results and methods of science in their instruction. What is the use of giving the student a scientific training if the man who instructs him in diagnosis and treatment neglects to show wherein this knowledge is applicable? This is largely a matter of comparison. We know that in foreign countries the clinical teacher is usually well prepared to use the results of science. In our own country, outside some anatomy, normal and pathological, this statement can not be made. Our best clinicians heretofore have been lacking in acquaintance with the facts and methods of the underlying experimental sciences. This, however, is a defect which time no doubt will remedy. The newer appointments to these chairs will be made from a group of men who have enjoyed the benefits of a better scientific preparation. It would, however, be a real advance if we should adopt what seems to be a practise in other countries, namely, to require those who expect to take positions upon the medical or surgical staffs to serve a preliminary year or two in a scientific laboratory, engaged upon research not too immediately practical in character. The suggestion made by Dr. Bevan that the positions upon the clinical staff might be filled by men who had served as instructors in anatomy, physiology or pathology is

most excellent. If this procedure became customary, if the professor of medicine, for example, selected his assistants from the teaching staff of the departments of physiology, physiological chemistry and pathology we should have an arrangement which, on the one hand, would supply the clinical departments with well-trained men, capable of undertaking independent investigations, and, on the other hand, would probably direct toward the laboratory subjects an abundant supply of young medical graduates, whereas under present conditions it is frequently necessary to go outside medicine in filling such positions. Third, What shall be the character of the duties and qualifications expected from those who have the chief direction of the work in the clinical departments? It is an interesting and somewhat surprising fact that in this part of our system of medical education no change of importance has been made in the methods of teaching during the last few decades. So far as the student himself is concerned no fundamental change in opportunities is required. Clinical instruction from the students' standpoint always had the great merit that it employs what we may call the laboratory method, as opposed to the method of learning from books. The student is brought face to face with experiments made by nature and he is given an opportunity to learn from personal experience rather than from the experience of others. In our modern schools his opportunities of this kind have been greatly increased and to this extent his instruction has been improved in his clinical years along the same line as in his preparatory years. But has there been a development in the methods of teaching in these clinical years corresponding to that which has taken place in the laboratory subjects? What we find is that the backbone of the instruction in the clin-

ical branches consists now, as formerly, of exercises in the clinics and operating rooms of the hospital and the dispensary, and these exercises are conducted by practitioners of medicine who devote a little time to their duties as teachers, but give most of their time and energy to their private interests. As long as our medical schools were private corporations founded partly for the public good, but partly also for the personal advancement of the members of the corporation, this division of time was natural and permissible. But our best schools are no longer private enterprises; they constitute a part of a university whose functions are solely to advance the public good and not in any sense to exploit private interests. As has been well said by one who speaks with great authority, the university discharges its direct duties to the public in two general ways, by teaching and by investigating; by providing systematic instruction in all forms of that knowledge which has been accumulating from the beginning of our race, and by promoting all good methods for increasing knowledge. These duties are performed through her teachers. She therefore selects her professors for their ability to teach and to investigate, and to insure that these functions are performed in the best possible way they are required to devote themselves entirely to her service. In this respect, as we know, the professors in the clinical branches, and possibly also the professors in some of the other professional schools, are on a different plane from the university professor proper. It is an interesting, and it seems to me a perfectly proper question to ask whether this distinction is a necessary and advantageous one. Does it constitute an inherent characteristic of professional instruction? This is a somewhat delicate and complex question which should be discussed not

simply from the standpoint of the ideal, but also with reference to what is really feasible under conditions as they exist. Time does not permit such a discussion and I must limit myself to a brief statement of what seem to me to be the tendencies now developing. One curious, if not important, phase I may note in passing, namely the practise that seems to be growing of paying the clinical professor the full salary given to the other professors in the university. The professor in the clinical subjects is designated as a professor in the university, and although he is permitted to engage in a lucrative private business he is given a salary as large as that paid to the usual professor who devotes his entire time to his university duties. There is a manifest inequity in this practise, and it produces a distinct feeling of discontent among the teachers. It would seem to me that the university ought not to submit to this condition, unless it is actually forced to do so to obtain the men that it wants. As a matter of fact the indirect benefits attached to these positions in a good university school are so great that I believe there would never be difficulty in obtaining the best men to fill them whether they carried a salary or not. But if a salary is attached it should certainly not be so large, under present conditions, as that paid to other university professors, otherwise the university deliberately places a premium on the teaching done by the clinical instructors which tends to discredit the work of the other teachers. But this is a more or less incidental matter. The really important standpoint from which to view the subject is what are the means by which the university, through its medical department, can discharge most efficiently its obligations to the community. It wants to send out practitioners of medicine qualified in the best possible way to treat the sick, it

wants to do its part in throwing additional light upon the causes and treatment of disease. Now the first of these functions is not so very difficult of performance. Under conditions as they are teachers of medicine and surgery can be obtained who will give to students the best methods of diagnosis and treatment, and so far as the limited time permits will send them out into the world prepared to develop into competent practitioners of medicine. There can be no doubt, however, that this function would be performed more satisfactorily from the standpoint of the school if an arrangement could be made whereby the professors gave more time to the work of instruction. But the provisions made for the advancement of knowledge by investigation are not so satisfactory as they should be. Whatever may be the position of a proprietary school in this particular, the university school surely can not be satisfied with playing the part of a mere reflector of knowledge. The spirit of investigation is wide-spread in medicine at the present day. We have the highest kinds of hope that the methods of science may be applied with success to the study of diseases of all kind. There has been an extraordinary increase in our knowledge of infectious diseases, and resulting therefrom a really wonderful improvement in our control of the conditions threatening public and private health. All this we owe directly to the use of the laboratory method of investigation. A similar victory may be gained over the numerous constitutional and nutritional diseases whose causes are at present hidden in the secrets of the body metabolism, but to accomplish this desirable end, or at least to accelerate its accomplishment, we must organize more satisfactorily our means of investigation. Shall we limit our investigations to the laboratories of the medical sciences and to special insti-

tutes, or shall we extend them into the clinical branches? It is almost useless to put such a question. Investigation by experimental methods has spread into the clinical departments, and a great increase in the development of this phase of research activity may be regarded as inevitable. The point that has been raised and which I should like to emphasize is that our present system is not well adapted to promote this kind of work. Our custom is to appoint as heads of these departments men who are engaged in the practise of medicine, and it is perfectly evident that if these men give themselves unreservedly to the demands of practise their efficiency as teachers and investigators will be seriously impaired, indeed, in the latter particular, will probably be destroyed altogether. To attain the combination of those qualities which are most desirable from the view-point of the university one of two changes should be made. Either there should be a definite limitation placed on the time given to outside practise, so that opportunity of a known extent may remain for teaching and research, or these positions should be placed squarely on a university basis, the practise of the incumbents being limited to the hospital and dispensary and the laboratories attached to them. The two propositions bear to each other somewhat the relation of a half loaf to a whole loaf. Neither of these principles is in force to-day, so far as I know, in any of our better schools. Investigations that bear directly on the problems of practical medicine are carried on in the laboratories of the medical sciences, in the special institutes, and by the younger men in the clinical departments who are preparing themselves for higher positions. We possess also a certain small number of professors of medicine and surgery who, in spite of abundant opportunities offered to enlarge their incomes,

are so deeply interested in the work of investigation that they voluntarily limit their outside practise and devote a considerable portion of their time and energy to genuine research. These are noble spirits, for they make a real sacrifice for the sake of a worthy principle. Medicine owes much to them not only for results actually obtained, but also for their example and influence which permeate the whole department with which they are connected, and influence favorably to some extent every student brought into contact with them. But the number of such men is very small, for I would not add to this honor list those whose names appear sometimes in our literature as contributors, but who are in reality patrons of research rather than actual workers. The position of our clinical professors in relation to their duties toward the school, on the one hand, and their opportunities for increasing their private practise, on the other, is so similar to that which formerly existed in the departments of the medical sciences that one naturally assumes a similar outcome. The practitioner was displaced from the chairs of anatomy, physiology and pathology, because the scientific knowledge and laboratory technique had become so specialized that it was impossible for the man in practise to do the professorial work with honor and success. The principle of competition between the schools soon determined which kind of professor was most needed. In the same way precisely science and laboratory technique and the spirit of investigation are pushing hard into the clinical branches. The professor of medicine who gives himself to outside practise, and at the same time attempts to keep up with the scientific development of his subject and to make and direct the investigations which his position in a good school demands is putting himself under a great strain at present, and the

indications are that soon this strain will become too great. Specialists will be demanded for the heads of our practical branches as they are now for our theoretical branches. It seems quite possible that here again the principle of competition will be the decisive factor. The university school which shall first establish departments on this basis may, and in my opinion will, secure both reputation and students as compared with schools organized on the present system. Whether a professor of medicine, surgery, obstetrics, etc., whose practise upon patients is limited to the hospital and dispensary will be as well qualified as the man with an extensive outside practise to teach his students medical art as well as medical science, and to attain the proper influence among his brother physicians are questions that have been somewhat discussed, but the only way to find out the correct answers is to try the experiment. All the theoretical reasons favor such a change. The practise of the hospital is much more rigorous than private practise from the standpoint of the acquisition of the methods of diagnosis and treatment. I fancy that any physician will admit that experience and real knowledge accumulate at a rapid rate in the hospital as compared with the results of the looser discipline of outside practise. A man whose diagnoses are based upon the most complete examinations possible and whose errors are continually subject to the salutary correctives of autopsy and pathological demonstration is likely to make a very exact and practical teacher. As regards the matter of the relation of these men to the medical public there can be no room for a difference of opinion. It is they who would have the golden opportunity to acquire precise knowledge, to keep thoroughly abreast of the latest and best in the medical world. It is they who in medical societies and

medical journals would be best qualified to speak with full knowledge, and in professional circles knowledge gives authority whatever may be the case with the public at large. A practical difficulty in making such a change in the character of the appointments to the clinical chairs, which interests the university authorities directly, is the doubt whether properly prepared men would be willing to surrender the rewards and popular appreciation that are attached to the career of a successful physician. This is again the kind of question that discussion does not throw much light upon. When we meet with difficulties of this kind in laboratory work we put the matter to the test of experiment and thereby settle the dispute. Our country is in a peculiarly favorable position to make such an experiment. Our system of medical education has heretofore simply developed along lines laid down by the experience of foreign countries; perhaps in the direction suggested above we may have an opportunity to take the lead instead of trailing along in the rear. I have had occasions to talk with a number of young clinicians on this topic and I have arrived at the conviction that many of them would eagerly accept an offer which, while assuring them a modest but sufficient competence, would also open to them a career so promising in influence, reputation and possibilities for doing the highest good to mankind.

W. H. HOWELL

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THE WINNIPEG MEETING OF THE BRITISH ASSOCIATION¹

On Wednesday, August 25, the British Association for the Advancement of Science will meet for the third time in the Dominion of Canada. Twenty-five years ago the first Canadian meeting of the association was held

¹ The London Times.

in Montreal. Thirteen years later, in 1897, advancing a stage further westwards, the association met in Toronto. This year the place of meeting will be Winnipeg, the Gateway City, as it has been called, of the Canadian northwest.

The growing frequency of these flights of the British Association to the dominions beyond the seas will be realized when it is remembered that in the interval since the meeting in Toronto the association has paid a visit (in 1905) to British South Africa. The Montreal meeting in 1884, which initiated the extension of the British Association's meeting-grounds to places outside the British Isles, was not decided on without many heartburnings. For over half a century, since its establishment in 1831, the association had always held its annual meeting in one of the ancient seats of learning or one of the centers of modern industry and commerce in the mother country; and the proposal that it should depart from this custom excited much opposition from those who were wedded to the old order of things. The proposal was first mooted at the jubilee meeting of the association at York in 1881, when Captain Bedford Pim gave notice of his intention to move at the meeting of the following year "that the British Association do meet in Canada in 1885." In Canada itself this proposal was taken up with the greatest heartiness; and before the end of the year the Marquis of Lorne, then Governor-General of Canada, wrote to Mr. William Spottiswoode, as president of the Royal Society, giving an invitation to the association to meet in the dominion in 1883. Various circumstances prevented the council of the association from accepting this invitation, whereupon a further invitation was sent to the association to meet at Montreal in 1884. With a view to testing the feeling of members of the general committee with regard to a proposal which undoubtedly involved a serious departure from the accepted policy of the association, a circular letter was issued inquiring how many members of the committee would be able to accept the Canadian invitation. Only 230 out of 700 members of the general committee re-

plied to this letter, and of these replies only 74 were favorable.

At the Southampton meeting in 1882, the proposal was discussed at length, and ultimately it was decided to accept the invitation from Montreal. So strong, however, was the feeling on the part of many members against what they regarded as an undesirable and dangerous innovation that a memorial was drawn up and presented to the council, questioning the legality of the decision to meet outside the British Isles and calling for a special meeting of the general committee to be summoned to reconsider the matter. This request was not acted upon; and at the Southport meeting in 1883 the council was able to show that all fears that the proposed Canadian meeting would prove a fiasco, owing to the failure of any considerable body of members to attend, were groundless, since between four and five hundred members had already signified their intention of taking part in the Montreal meeting. As a matter of fact, as the time for meeting drew near so much eagerness was shown to take part in the visit of the association to Canada that the council had to take steps to restrict the election of new members. Many persons who failed to secure election in England went out to Canada without vouchers and presented themselves for enrolment in Montreal; and altogether the total number of visitors who crossed the Atlantic and registered their names on the lists of the association in Montreal amounted to 910, while the total attendance at the meeting was 1,777.

Much of the success of the Montreal meeting in attracting a large number of visitors from the old country was no doubt due to the exceptional nature of the privileges extended to members of the association by the Canadian authorities. The potential greatness of the resources of the Canadian northwest was not then realized as it is to-day; and the dominion government and people were eager to attract to their shores a representative gathering of the most eminent scientific men in this country who would not only give an impetus to the educational development of Canada, but who would spread on their return home a better

knowledge of the greatness of the heritage belonging to the empire in British North America. The privileges extended to the visitors in 1884 might, indeed, well make envious their successors in 1909. They were given free passes over all government railways, over the Canadian Pacific Railway, and over the Canadian Atlantic Railway, while after the meeting a special party of one hundred and fifty members was carried free to the limit of construction of the Canadian Pacific Railway, then open to Stephen, the summit level of the Rocky Mountains. The city of Toronto entertained as its guests after the meeting a party of three hundred members. The transatlantic steamship companies undertook to transmit a limited number of free messages from members to their friends in England, while the overland companies accepted social telegrams for free transmission to all parts of Canada and the United States. The dominion parliament voted a grant of \$20,000 as a contribution towards the traveling expenses of the visiting members, and an additional grant of \$5,000 was afterwards voted towards the general expenses of the executive committee. The city of Montreal voted \$5,000 towards the expenses of the visit, while the subscriptions of private citizens for the same object amounted to \$4,820. Thanks to all this public and private generosity, the Canadian committee was able to transmit to the association a sum of \$14,000 for the purpose of reducing the cost of members' passages to Canada.

Alike on the social and scientific side the meeting fully justified the faith of its promoters. At the inaugural gathering Lord Rayleigh assumed the presidency of the association, and dealt in his opening address with recent progress in physical science. At this distance of time, it is interesting to note that though Lord Rayleigh was able to describe the lighting of large passenger ships by electricity as already "an assured success," he had also to state that "at present we have no experience of a house-to-house system of illumination (by electric light) on a great scale and in competition with cheap gas; but preparations are already far advanced for trial on an ade-

quate scale in London." The vice-presidents of the meeting included the Governor-General of Canada, Sir John Macdonald (then Premier), Sir Lyon Playfair and Sir Charles Tupper; while among the sectional presidents were Lord Kelvin (then Sir William Thomson), Sir Henry Roscoe and Sir Richard Temple. Others who attended included Sir (then Professor) James Dewar, Admiral Sir Erasmus Ommanney, Dr. W. H. Perkin, Sir (then Mr.) W. H. Preece, Sir (then Professor) Robert Ball, Sir (then Professor) Oliver Lodge and General (then Lieutenant) A. G. Greely, of the United States Army, who was but lately returned from his famous Arctic expedition. It is interesting also to note that in 1884 the association met in only eight sections as compared with the eleven of the present day, physiology, botany and educational science then having no separate sections devoted to their special consideration.

The Toronto meeting, held in August, 1897, was again notable for the lavish hospitality extended to the visiting members of the association by their Canadian hosts. The meeting was not, however, nearly so large as that at Montreal, the attendance numbering only 1,362 members, associates and foreign guests. Otherwise this second trip of the British Association's to the Canadian Dominion was no less successful than the Montreal meeting in giving an impulse to the cultivation of the scientific spirit in Canada and in furthering the spread of imperial sentiments. At the inaugural gathering Sir John Evans, the treasurer of the Royal Society, took over the presidency of the association from Lord Lister; and one of the pleasantest of the social functions was a banquet given in honor of Lord Kelvin, Lord Lister and Sir John Evans. Among the sectional presidents were Sir (then Professor) William Ramsay, Sir (then Professor) Michael Foster and Dr. George Dawson, C.M.G., the late director of the Canadian Geological Survey; while the evening lecturers were Dr. John Milne, Professor W. Chandler Roberts-Austen and Dr. H. O. Forbes.

At Winnipeg, where the association is to hold its meeting this year, the visitors will

find themselves in a city which is the living embodiment of the remarkable development of Canada's western prairies during the quarter of a century which has elapsed since the association's first visit to Canada. Less than forty years ago a simple trading post of the Hudson's Bay Company occupied the position where to-day stands the third largest city in the whole Dominion of Canada. In 1870 Winnipeg was a mere outpost of the empire, boasting of a population of 215 souls. When the last census was taken in 1901 the population was 42,000, a sufficiently notable development, but small in comparison with the rapid extension of the city in the last few years. At the end of 1907, according to the handbook which has been issued by the local executive committee in connection with the forthcoming meeting, Winnipeg contained no fewer than 118,000 people. It was only in the spring of 1879 that the city was placed in railway communication with the outer world; and a handy "Souvenir of Winnipeg," issued in connection with the visit of the association to Montreal in 1884, contains as frontispiece a quaint view of the main street, in which the most prominent conveyances are single-horse trams. To-day smart electric trams traverse the city in all directions, and Winnipeg, situated at what has been called the wasp's waist of Canada's railway system, is one of the most important railway centers in the dominion. It is not uninteresting to note some of the statistical facts so proudly quoted in the handbook to which reference has been made as evidence of the extent and importance of the city. Winnipeg, we are there told, has 291 miles of paved and graded streets, 170 miles of water-mains, 675 electric street arc-lights, 29 miles of tramways and 28 schools. Covering an area of 19,000 acres, its total assessable property was valued in 1907 at \$106,000,000, or more than double the value in 1904. The output of its manufactures in 1905 was valued at \$19,000,000; its bank clearings in 1907 totaled \$600,000,000; while as the outlet for the wheat harvest of the Canadian northwest it boasts of being the greatest grain market in the British Empire.

Some particulars have already appeared in *The Times* of June 7 about the local arrangements for the forthcoming meeting. There is every prospect that a considerable body of members of the association will cross the Atlantic, though the inducements which are offered to undertake the journey are nothing like so tempting as in the case in the earlier Canadian meetings. The transatlantic steamship companies have decided that it is impossible to depart from the agreement which exists between them not to make any reduction of fares during August, though so far as possible they are prepared to allot special accommodation to members and associates traveling as first-class passengers. The Canadian railways have arranged to carry members of the British Association party at special rates, generally amounting to a single fare for the double journey. It is impossible, of course, to estimate with exactness the cost of the trip, everything depending on the individual tastes of the visitor and on the length of time he is prepared to spend in Canada.

In no case, however, can the trip be undertaken without a considerable expenditure of time and money. The local committee, without making any allowance for the reduction of railway rates, has estimated that the cost of the return journey, occupying about six weeks from Liverpool, will range from \$384 to \$500, or say in round figures from £75 to £100, according to the nature of the accommodation required. To meet the expenses of the visit the dominion government has made an appropriation of \$25,000, while the city of Winnipeg has voted \$5,000. A portion of these grants will be available to lighten the cost of the visit in the case of those taking an active part in the meeting, but the relief thus afforded will only be very small, and necessarily considerations of both time and cost will prevent many of the leaders of scientific thought in this country from undertaking the journey to Winnipeg. Those, however, who do go will, it may be hoped, form a fair representation of British men of science; and the particulars which are now available about the sectional programs afford abundant evidence that on the

scientific side the meeting will not fall below the high standard of former gatherings, either in this country or in the colonies.

The president of the association at Winnipeg will be Sir Joseph J. Thomson, F.R.S., Cavendish professor of experimental physics at Cambridge. In his opening address the president will refer to the importance of original research as a means of education, the advantages and disadvantages as a training for work in science of the systems of education now in force in our schools and universities. He will deal with the light thrown by recent investigation on the nature of electricity; on the relation between matter and ether and the part played by the ether in modern physics; and a discussion of some problems raised by the discovery of radium.

THE SMITHSONIAN AFRICAN EXPEDITION

THROUGH the Smithsonian African Expedition under the direction of Mr. Theodore Roosevelt, the National Zoological Park at Washington has been presented by Mr. W. W. McMillan, of Juju Farm, near Nairobi, British East Africa, with an exceptional collection of live African animals.

In a letter recently received at the institution from Lieut. Col. Edgar A. Mearns, of the expedition, it is stated that the collection includes eleven large mammals and three large birds, all in fine condition and for the most part well broken to captivity, as follows: a male and female lion, two years old; a male and two female lions, seventeen months old; a female leopard, a pet of Mrs. McMillan; two cheetahs; a wart hog, two years old; one Thompson's and one Grant's gazelle, well grown; a large eagle of unusual species; a small vulture, and a large Buteo. Specimens of none of these, except the lions and leopard, are at present contained in the park.

The collection is now at the farm near Nairobi. Mr. A. B. Baker, assistant superintendent of the National Zoological Park, has been designated to take charge of its transportation to this country, and for this purpose has sailed from New York on the White Star Line steamer *Arabic*. On his way to Nairobi,

Mr. Baker will stop at London, Hamburg and Mombasa, to perfect details of shipment.

It is intended to secure for the park from Mr. Henry Tarleton, of one of the farms near Nairobi, two Coke's hartebeests, a female water-buck and several zebras, specimens of which are not now owned by the park.

PROFESSOR NEWCOMB'S LIBRARY

THE executor of the estate of the late Professor Simon Newcomb (Mrs. Anita Newcomb McGee, 1620 P Street, Washington, D. C.) offers for sale his complete library of books and pamphlets on astronomy, mathematics and allied subjects. During the working years of his life it had been his policy to possess for himself, so far as circumstances allowed, the books necessary in his work. As years passed on it seemed to him that the collection would prove to be of permanent scientific value and he therefore enlarged it by the addition of books which he did not need at the time but which he deemed most useful to the future investigator, especially the student of scientific history. It had been his hope that his library would help in the training of some future great scientist, or in his work. This being his motive, he was especially anxious that the library should not be divided, but should belong to some institution in which astronomical and kindred branches of research are carried on.

With this end in view the value of the library is estimated at only \$7,000, which is the estimated cost of the purchased books alone, although the number of transactions of societies and other gift books together with the many thousand pamphlets form a very considerable portion of the value of the library.

There are nearly 4,000 volumes and about 4,000 pamphlets in the library; the pamphlets are all classified and arranged for easy reference and include reprints of memoirs of astronomy, mathematics and physics. In round numbers 1,000 volumes are complete sets of publications of learned societies and observatories.

There is a complete set of Crelle's journal. There are 75-100 catalogues of precision (star-

places). The library is especially rich in all branches of astronomy, including popular works, history of astronomy, ancient astronomy, mathematical astronomy, astrophysics, stellar astronomy and photographic astronomy. The large number of volumes on celestial mechanics, including the works of the most celebrated writers is worthy of special mention. The bulk of the library is of course on astronomy and mathematics, the former predominating, but there are also several hundred volumes on physics, geography and meteorology, and many of the transactions cover general science. It is believed that this is the most complete library of its kind in America except, perhaps, that at Harvard University and including the Harvard Observatory library.

In addition to the above and not as yet catalogued, are several hundred—possibly approaching 1,000—books, reports and volumes of periodicals on economic subjects. This is also for sale with or apart from the above.

A typewritten catalogue of this library has been prepared under Professor Newcomb's personal direction in which the works are classified approximately on the system now current in catalogues of astronomical literature. This will be sent to any one contemplating purchase of the collections as a whole. Until about the middle of September the library will remain in place and may be examined.

SCIENTIFIC NOTES AND NEWS

PROFESSOR SAMUEL WILLIAM JOHNSON, emeritus professor of agricultural chemistry in Yale University, where he has held a professorship for fifty-three years, a member of the National Academy of Sciences since 1866, past president of the American Chemical Society, eminent for his contributions to agricultural chemistry, died in New Haven on July 21 in his eightieth year.

PROFESSOR NEWCOMB's daughter, Mrs. Anita Newcomb McGee, 1620 P street, Washington, is engaged in the preparation of a biography of her father, and will be most appreciative of any assistance which his friends may render,

such as by sending her letters from him (which will be carefully copied and returned), or by furnishing any information about his life, anecdotes illustrative of character, etc.

DR. AUGUST HOCH, physician to the Bloomingdale Asylum and assistant professor of psychiatry in the Cornell Medical College, is to succeed Dr. Adolf Meyer as director of the Pathological Institute of the New York State Hospitals for the Insane.

As has been noted in SCIENCE, an Academy of Sciences at Heidelberg has been established with an endowment of a million Marks, given by Herr Lanz, of Mannheim. The original members of the academy are the following professors in the university: Bütschli, Curtius, Klebs, Königsberger, Kossel, Lenard, Nissl, Wolf, Wülfing.

THE University of Geneva has conferred on Lord Lister the honorary degree of doctor of medicine.

DR. C. W. STILES, U. S. Public Health and Marine Hospital Service, has been elected a foreign corresponding member of the Academy of Medicine of Turin.

PROFESSOR B. BRAUNER, of Prague, and Mme. Curie, of Paris, have been elected members of the Krakau Academy of Sciences.

MR. J. LUNT, astrophysical assistant at the Cape Observatory, has been given the honorary degree of D.Sc., by the University of Manchester.

THE medical students of Glasgow University met in the Union on June 25 to make a presentation to Professor John Cleland, whose intention to retire from the chair of anatomy, which he has occupied for thirty-two years, has been announced.

DR. CHRISTIANI BÄUMLER, professor of pathology at Freiburg, is about to retire from active service.

DR. WILHELM EBSTEIN, professor of medicine at Göttingen, has celebrated the fiftieth anniversary of his doctorate.

MR. STEPHEN DOWS THAW has been appointed assistant at the Allegheny Observatory, and Mr. Dinsmore Alter has been ap-

pointed fellow in astronomy at the same institution.

DR. ALFRED NIPPOLD has been promoted to be observer, and Professor T. H. Arndt to be chief of division in the Meteorological Institute at Berlin.

DR. V. A. MOORE, director of the State Veterinary College, Cornell University, is spending several weeks in Denmark, Germany and England. He is investigating European methods of controlling diseases of cattle.

DR. W. S. BRUCE, of the Scottish Oceanographical Laboratory, Edinburgh, has chartered a steam trawler, and is having her refitted for a scientific expedition to Prince Charles Foreland, Spitzbergen.

THE Christiania correspondent of the London *Times* reports that Dr. Nansen has now completed his preparations for the cruise which he is about to make in northern waters for the purpose of continuing his study of ocean currents and sea temperature, which have an important bearing on the questions of the fisheries and the climate of Norway. The voyage will be made in a small private yacht, which has been furnished with ice sheathing and is otherwise suitably equipped. Dr. Nansen intends to be away till the end of the autumn, and the cruise will cover the Norwegian sea towards Iceland and will possibly be continued to Greenland.

THE Society for the Promotion of Agricultural Science meets at Portland, Ore., on August 17, under the presidency of Professor Thomas F. Hunt, of the Pennsylvania State College.

DR. HERMON C. BUMPUS, director of the American Museum of Natural History, New York; Mr. Gifford Pinchot, United States forester, and Professor J. W. Toumey, of Yale University, were among the speakers in a program of illustrated talks on "Our Forests and their Conservation," given at Bar Harbor on July 27.

FRANK CARNEY, Ph.D. (Cornell), professor of geology in Denison University, delivered a course of lectures on "Geographic Influences" in the University of Virginia during the summer session.

WE learn from *Nature* that the first Gustave Canet lecture was delivered by Lieutenant Trevor Dawson at the twenty-fifth anniversary meeting of the Junior Institution of Engineers on June 30. The lecturer is the recipient of the first gold medal, which is to be awarded every fourth year by Madame Canet in memory of her husband, the award being made through the council of the institution.

MR. A. R. BROWN, M.A., fellow of Trinity College, Cambridge, has been appointed Martin White lecturer in ethnology in the University of London for the session of 1909-10.

A BRONZE memorial tablet in honor of the late Dr. George W. Hough has been unveiled with appropriate exercises in Dearborn Observatory of Northwestern University.

WE learn from the *British Medical Journal* that Sir Hector Cameron, on behalf of the committee of subscribers to the fund in memory of the late Dr. James Finlayson, of Glasgow, has presented a deed of gift to the council of the faculty of Physicians and Surgeons, Glasgow, conveying to the council the future management of the fund. The income from the fund is to be held and applied as the endowment of a lectureship to be called the "Finlayson Memorial Lectureship." The lectures are to deal with pathology, or the practise or history of medicine.

DR. T. H. LORENZ, docent for mineralogy at Marburg, has died at the age of thirty-four years.

THE international committee formed to celebrate the centenary of the publication of Avogadro's memoir on the molecular constitution of gases consists of eminent chemists and physicists throughout the world. The numbers from the different countries having more than one representative, and not including Italy, are: Germany, 23; France, 19; Great Britain, 17; United States, 10; Austria, 8; Holland, 8; Russia, 7; Switzerland, 6; Sweden, 4; Belgium, 3; Denmark, 2, and Norway, 2.

A METEOROLOGICAL and astronomical observation station at an altitude of about 14,000 feet is to be erected on Mount Whitney, California, by the Smithsonian Institution. The

work of preparing the trail up the mountain over which the material will be transported by pack mules is already under way. It is expected that the station, which will be temporary, will be completed by the first of September.

THE next international congress of mining and metallurgy is to be held in June, 1910, at Dusseldorf. The last congress was at Liège in 1905.

THE south, with twenty-seven per cent. of the total area of the United States, contains about forty-two per cent. of the total forest area of the country. The forest area by states is as follows: Alabama, 20,000,000 acres; Arkansas, 24,200,000; Florida, 20,000,000; Georgia, 22,300,000; Kentucky, 10,000,000; Louisiana, 16,500,000; Maryland, 2,200,000; Mississippi, 17,500,000; North Carolina, 19,600,000; South Carolina, 12,000,000; Tennessee, 15,000,000; Texas, 30,000,000; Virginia, 14,000,000 and West Virginia, 9,100,000. The south, it will be seen, has still much of the virgin forest of the country. This forest must be used, of course, in order to meet the steadily expanding wants of this section. It must be used in such a manner, however, that the very most may be made from its annual cut, while at the same time this cut is being replaced by new growth. In this way its timber will remain a source of perpetual wealth. The importance of forest conservation to southern interests is clearly understood by the people of the south. The future of the south is more nearly bound up in the plan of forest preservation, with its accompanying protection to watersheds, power-streams and wood-working industries, than is anything now before the people of this part of the country. Not only is the protection of the watersheds, which will some day furnish the power to run all manufacturing establishments in the entire south, an important matter to the south, but the industries depending upon the forest products will also be benefited by the protection thrown about the remaining timbered area.

The Globe and Commercial Advertiser, New York City, contained recently a truly remarkable article by Mr. E. F. Naulty, the character

of which may be judged from the following editorial introduction: "Edwin F. Naulty, of this city, has recently created lively interest and discussion by his assertions concerning the 'new' comet which he and Dr. Brooks, of Hobart College, announced to the world several weeks ago. Especial interest has attached to Mr. Naulty's statements attributing to the movements of this comet certain disturbing manifestations in nature, such as cyclones, fires and floods—and more particularly the numerous shipwrecks which have puzzled marine experts."

UNIVERSITY AND EDUCATIONAL NEWS

THE five hundredth anniversary of the foundation of the University of Leipzig is being celebrated this week. In addition to banquets and receptions, there are two academic ceremonies. At the first of these addresses are to be made by the rector, Professor Binding, and by the King of Saxony, followed by addresses from delegates; at the second, an address by Professor Wundt, followed by the conferring of honorary degrees.

It is proposed to establish in connection with the Paris University a system of exchange between French and foreign professors on similar lines to that which obtains between Germany and the United States. M. Liard, rector of the university, has made an appeal to create a fund for the purpose. M. Albert Kahn has placed at the disposal of the rector an annual grant of 30,000 francs for five years.

THE registration for the first term of the summer quarter at the University of Chicago shows a growth in every one of the schools of the institution. The total number registered on July 10 was 2,817, as compared with 2,593 at the end of July, 1908.

At the University of Chicago associate professors have been appointed from the grade of assistant professors as follows: Carl Kinsley, physics; Chas. M. Child, zoology; Anton J. Carlson, physiology, and H. Gideon Wells, pathology.

ELLIS E. LAWTON, Ph.D. (Yale), who has been professor of physics during the past year

in Colby College, has accepted the professorship of physics in Denison University.

MALCOLM E. STICKNEY, for several years assistant professor of botany in Denison University, has been promoted to the full professorship in that subject.

DR. C. E. STROMQUIST, of Princeton University, has been appointed professor of mathematics at the University of Wyoming.

W. E. WENGER, formerly assistant professor of railway engineering in the University of Illinois, has been appointed associate professor in the department of electrical engineering at McGill University.

THE council of King's College has elected Mr. C. G. Barkla, D.Sc., professor of physics, in succession to Professor Harold Wilson, F.R.S., who has accepted the chair in McGill University.

DR. E. KNECHT has been appointed professor of technological chemistry in the University of Manchester.

DR. EDUARD BUCHNER, of the Agricultural School at Berlin, has been appointed professor of chemistry in the University of Breslau, to succeed Professor Ladenburg, who has retired from active service.

DR. FRITZ COHN, astronomer in the Observatory at Königsberg, has been called to a chair of astronomy at Berlin.

DR. VOLKMAR KOHLSCHÜTTER, associate professor of chemistry at Strassburg, has been called to the chair at Bern, vacant by the retirement of Professor Friedheim.

DISCUSSION AND CORRESPONDENCE

A NOMENCLATORIAL COURT?

THE communication of my friend, Mr. Francis N. Balch, on the subject of a nomenclatorial court¹ has been perused with interest by me, not only on account of the novel proposition and the new point of view from which the subject was contemplated, but also because an analogous proposition has been for some years advocated by me in correspondence and conversation regarding zoological nomenclature.

¹ SCIENCE, June 25, pp. 998-1000.

As a lawyer, Mr. Balch does not need to be reminded that there are two sides to every question (else there were no lawyers), and in this case I venture to believe that what is needed is not a court, but more power to our legislature.

Courts have existed since before the days of Hammurabi, say some 5,000 years; yet I read last month in one of the current magazines an article by a Philadelphia lawyer (and his tribe has been proverbial for acumen these hundred years), writing from his own experience, that in the courts of that city the decision in a case of simple fraud was had only after three years delay; and that business men were submitting to robbery or arranging arbitrations, rather than to take the uncertain chances of court justice in that city. And similar complaints in other cities are so common as to excite no interest except in the parties concerned.

We will admit that the complexity of business affairs makes common-sense justice a difficult ideal to attain, yet it seems as if one would not gain much by instituting nomenclatorial courts.

Nomenclature has existed in its binomial form, which alone concerns us, for 150 years, and in its present shape is a development or evolution from more simple conditions. It is common to hear nomenclature treated as an unimportant and unscientific matter, and the discussion of its principles denounced as trivial and unworthy the attention of those capable of research.

On the contrary, I am prepared to maintain the thesis that except the strictly accurate determination of the facts of science and their interrelations, nomenclature is the most important branch of any science. It is not unworthy of the best and most thorough study that clear heads can devote to it. It is, in short, the summation of all the facts of science in systematic form; without a strictly devised nomenclature there could be no science worthy of the name. It is to science, regarded as the facts of the cosmos, what language is to mankind, without which they could not have risen above the brutes.

With a muddled nomenclature nothing can be clear, and, far from being ignored by men of science, this was recognized as early as Adanson in 1757, a year before the tenth edition of Linnæus.

Owing chiefly to the difficulty of prompt intercommunication between scientific men, it was only after posts, railways, etc., began to alter ancient conditions that scientific men began to get together on general questions of nomenclature. In 1842 the result of some years of discussion was the appointment of a legislature, in the form of a British Association Committee, to prepare laws and formulate the rules of practise which had grown up by a sort of common consent. There was then, as now, a certain number of dissidents, but they did not count for much. This legislature was British, but its code was adopted at once by the American Association and very shortly by the scientists of all civilized countries.

A truly international status was given to the code, when the committee of the International Zoological Congress to consider nomenclature was appointed. This committee has met the growing complexity of the subject in the most satisfactory manner, though by necessity always a little behind the growth of the science. A person can not be considered competent to discuss nomenclature unless he knows and understands the rules of the international code. Many do not, yet "rush in," hence much unnecessary controversy.

The object of this legislature has been to make a series of rules (= laws) which any intelligent person by careful study can utilize to settle nomenclatorial questions. The cases which can not be settled by a rigid application of the code are rare. There are some such and they arise chiefly out of the existence of certain scientific works or systems which appeared in the formative period of nomenclature and about which the question arises, "Are they to be accepted as binomial?" or, "Should they, being binomial, but long obsolete or practically unknown, be admitted to disturb names which, though not entitled by the code to stand, have yet become useful through familiarity?"

Now there are a few works in this category which might be brought before our legislature (International Committee) to which I should be willing to give the power to say arbitrarily, "This book or the names in it shall not (or shall) be considered in nomenclature," on petition as to books of this category. I am not sure that much good would result, for the application of the code has been made in so many instances that the dubitable names are already more familiar to the younger men than those they replace. Still the main point is to gain stability and have the question settled definitely one way or the other; so I have for some time favored giving to the international committee the despotic power I have indicated in addition to those they already possess.

In regard to the particular instance referred to by Mr. Balch, it is sufficient to say that the question is already settled definitely by the code, where Mr. Jukes-Brown will find the answer when he becomes familiar with that body of laws. His uncertainty reminds one of the lady lawyer who, finding herself puzzled in the course of an argument, appealed to the late Chief Justice Wylie, who was hearing the case, as to what course she should pursue, and was dryly advised to consult a good lawyer.

One other question has recently been raised in *SCIENCE* about which a word may be proper here. That is about the use of personal specific names. The objection to them comes chiefly from those who have not yet fully appreciated the axiom that "a name is a name and not a definition." They have become commoner because the Latin adjectives in genera of many species are largely already in use, and a personal name is much less likely to prove a synonym. Further than that it is a mere question of personal taste.

WM. H. DALL

June 28, 1909

THE COMPARATIVE ENROLMENT OF STUDENTS OF ENGINEERING

TO THE EDITOR OF *SCIENCE*: The communication by Mr. Tombo in the issue of *SCIENCE* for June 4 is interesting as showing the in-

crease or decrease in registration at the particular institutions mentioned, but it is hardly fair to draw conclusions for the entire country unless the engineering students at all institutions are included.

For instance, the total increase of 1.15 per cent. is changed by one third of its value if the University of Pennsylvania be included in the count. The enrolment at that institution for 1907-8 was 748; for 1908-9 it was 811; the increase is 63 or 8.4 per cent. As the school in question has the finest engineering building in the country and the most modern equipment and as its increase was only exceeded by two schools in the published list, it is not clear why it was omitted in the count.

It is to be noted also that only one school south of the Ohio River is considered. The total might be substantially changed by including that half of the country.

It is hardly fair, too, to infer a general trend from figures for a year following a period of financial and industrial depression.

M. G. LLOYD

THE omission of the University of Pennsylvania in the table was entirely due to inadvertence. This institution was on the list originally prepared by me, and either my letter to them or their report to me must have gone astray in the mails, and in preparing the final table I failed to note the omission. The enrolment of the engineering schools of the University of Pennsylvania for 1907-8 was 748, for 1908-9 it was 811, thus showing an increase of 64 students or of 8.4 per cent. In size, therefore, the school of this institution would rank eighth among the schools contained in the table. There was no intention to draw conclusions for the entire country, but I see no objection to inferring a general trend from figures giving the enrolment of two dozen representative institutions. So far as the southern schools are concerned they are, speaking broadly, not as important as those included in the table, and furthermore, although efforts were made to secure the figures of the most important of these schools, it

failed to comply with my request. Mr. Lloyd is no doubt correct in attributing the decrease in attendance at a number of the institutions to the financial and industrial depression of the preceding year.

I might point out in this connection that it seems rather unfortunate that separate enrolment figures for the technological schools are not given in the annual reports of the United States Commissioner of Education, such as are given, for example, for theology, law, medicine, dentistry, pharmacy, etc. I appreciate the difficulty of distinguishing between pure technological students and academic students who are candidates for a degree in science, but it seems to me that it would be eminently worth while to prevail upon the reporting institutions to make this distinction in future. A table illustrating the changes in the attendance on the engineering schools of our country similar to that found on page 777 of volume 2 of the Report of the Commissioner of Education for 1908, which covers theology, law, medicine, dentistry and pharmacy, would be of great value and deep interest.

RUDOLF TOMBO, JR.

SCIENTIFIC BOOKS

Psychotherapy. By H. MÜNSTERBERG, M.D., Ph.D., Litt.D., LL.D. New York, Moffat, Yard & Co. 1909. Pp. 401.

In an article touching on the popular propaganda for child-study, Münsterberg wrote ten years ago in the *Atlantic Monthly*¹

I have always found psychology silent as a sphinx when I came to her with the question of what we ought to do in the walks of practical life.

He has now turned to a very different attitude. In a series of books he discusses, for a wider public, the practical applications of modern psychology. The present volume deals with the relations of psychology to medicine, and aims to reach a wider public, physicians, ministers and all who are in practical contact with the important question of psychotherapy. It is not meant to have the form of loose popular essays, a form preferred where wide attention is to be attracted to a new topic, as in last

¹ Vol. 85, p. 661.

year's presentation of the work of Stern and Jung and others as psychology applied to witnesses. It is to deal with the whole cycle of the over-popularized problems of psychotherapy "in a serious systematic way and to emphasize the aspect of scientific psychological theory." A worthy aim is to strengthen the public feeling that the time has come when every physician should systematically study psychology, the normal psychology in the college years and the abnormal in the medical school. Scientific medicine should take hold of psychotherapeutics now, or a most deplorable disorganization will set in.

This is a rather complex and difficult problem. Psychotherapy is in the air and wildly exploited in the book-market and in magazines. Every new book is devoured with avidity by a heterogeneous set of readers prompted as a rule by curiosity or eagerness to get a few helps to bolster up their own theories and exploitations. I see the book in the hands of utterly untrained persons, whose "practical contact with these important questions" is chiefly the desire for self-help or the promptings of curiosity. This is inevitable for a series of books "for a wider public."

Münsterberg says in his preface:

To those who seek a discussion of life facts alone, the whole first part will, of course, appear to be a tedious way around; they may turn directly to the second and third parts.

I can not help feeling that the average reader will go directly at the chapters with the records of cases only, so that we should really review the book from three standpoints: Its efficiency (1) as a serious unit; (2) as a presentation of facts for those who would as well forego the trouble of a careful digestion of the real principles, and pass over a really most valuable part of the book, and (3) the efficiency of the book from the point of view of a collection of case records.

This may make the author responsible for the inevitable. But where the author himself realizes that he invites certain readers to make a partial use of the book only, his responsibility is admitted. I must leave the verdict to him and the critical readers.

Instead of starting from the simpler facts which everybody can experience, and possibly try, to the more complex phenomena which the majority will have to be satisfied to be able to merely "understand"—or let alone—Münsterberg takes the reader first through a "pains-taking and perhaps fatiguing inquiry into principles, before the facts are reached"; chapters on the aim of psychology, mind and brain, psychology and medicine, a chapter on suggestion and hypnotism and a discussion of the subconscious (which is rather dramatically eliminated by the three words "there is none," but after all rather fully discussed). A statement of the simple and plain facts and then a reply to the probable queries of the unsophisticated and the sophisticated varieties of readers would have been more illuminative and more likely to bring home necessary principles to readers who should get them in direct proportion to their eagerness to take in the stories and facts.

In the second part Münsterberg discusses first the field of psychotherapy, the general and special methods, and only after that the mental and bodily symptoms (or facts to be dealt with); he introduces the concrete instances as mere examples instead of a starting point of demonstration and analysis and the principal reason for a discussion.

The third part is devoted to the discussion of the place of psychotherapy in its relation to the church, to the physician and to the community, with a thoroughly sane standpoint and with interesting perspectives.

The effect of the book on physicians, from what I have gathered from a number of inquiries, has been somewhat disappointing. The book has not the breadth of the presentations by physicians like Forel, Moll, Löwenfeld and others; the examples of psychotherapy are chiefly enumerations of cures with profuse expressions of gratitude, without enough reference to failures and to their number and reasons, and without always satisfying the physician to the point of helpfulness. We can safely say that the *medical* contribution is chiefly that of great optimism, and the somewhat dramatic examples frequently a comment

on the narrowness and limitation of the therapeutic fund of most physicians, but too exclusively selected from among the successes. The *theoretical* discussions are in the main sound and in many points unusually helpful and suggestive, but unnecessarily loaded with difficulties of Münsterberg's own making. To some of us it must seem unfortunate to see the undue contrast between psychiatry and psychotherapy ("psychotherapy is sharply to be separated from psychiatry," whereas the fact is that just now many psychopathologists know little psychiatry and many psychiatrists little psychopathology, but for reasons extraneous to the real principles), and the over-emphasis of the contrast of "the attitude of appreciation" and "the attitude of physical explanation," the contrast of the subjective and objective, of the purposive and the causal view—which is raising a string of difficulties which might be dispelled rather than emphasized; further such claims as:

Whatever belongs to the psychical world can never be linked by a real insight into necessity. Causality there remains an empty name without promise of a real explanation (p. 32).

We are practically made to believe (p. 43) that translation of the facts into neurological terms furnishes the only real explanatory ground. Is not the rôle of the psychophysical doctrine chiefly that of eliminating *harmful features* of a dualistic standpoint which hardly would present itself to a well-guided observer of the simple and plain facts? Does it not call for mere neurologizing tautologies unless we know much more about neuro-physiology?

A plausible and attractive presentation of the problem of attention relieves the start with sensationalism and association psychology. In the "psychophysical" scheme (p. 50) the *quality* of the "elements" is traced to the local position and connection of the brain cells, the *intensity* corresponds to the energy of the excitement; and the *vividness* to the relation of motor channels. But then the reader must wrestle with the claim that "psychology must destroy unity and freedom of our personality" (p. 51)—probably because "any will which is not understood as deter-

mined by causes is simply an unsolved problem"? Owing to the *possible* confusion of morality and mentality the reader is forced to see that the physician and psychotherapist must use his weapons quite irrespective of what he knows chiefly from the *purposive* point of view of experience; a word of encouragement, such as "my friend, be courageous and faithful," is said to be used differently by the physician from what the layman or the minister has in mind, viz., merely as natural and psychophysical material to secure a certain effect, just as sodium bromide would be used. Why this appearance of insincere elimination of the inevitable human feature of a useful reaction, and this reduction to a cold-blooded "scientific" spirit? I grant that "The highest moral appeal may be even a most unfit method of treatment and the religious emotion may just as well do harm as good from the point of view of the physician" (p. 84); but may not equally miscalculated "causal" use of mental suggestion and similarly uncritical uses of supposedly "efficient stimuli" be as harmful? It is not so much the standpoint that makes the trouble, but certain improprieties and the possible disregard of experience. Difficulties concerning the relation of the morbid manifestations and the "underlying" factors are awkwardly introduced in the frequent emphasis of the contrast between "disease" and "symptom":

The mind reflects only symptoms of the disease; the disease itself belongs always to the organism.

How about the mind and the symptoms? What does this contrast mean in hysteria? Are not the "symptoms" the factors to be handled and practically all we know of the "disease"? I do not deny that a certain medical attitude gets a useful background through these distinctions. But it is an attitude which creates more confusion than good, and which some of us are trying to make unnecessary without surrender of scientific principles. A distinction between leading or essential facts and incidental or accidental ones does more for clearness than the distinction of disease and symptoms.

The chapters on suggestion and hypnotism

and on the subconscious are the climax of the introductory part. In the former the actual constructive material is very profitable and might have been given the lead to the extent that the negative character of the key-note of the latter chapter—"There is no subconsciousness" might readily have become the inevitable conclusion, instead of appearing like a quibbling over terms, to one who may have used the expression in a sense more justified than the one criticized by Münsterberg. The positive contribution of these two chapters belongs to the best the book offers. It reduces suggestion to the principle of suppression of opposite tendencies and impulses and wishes, shows that there is no action which has not its definite opposite, and that the induction of opposite mental states constitutes the eliminative and curative power in suggestion. Münsterberg shows how this same principle holds also for attention; how attention leads to making the object clearer, while in suggestion we change it in adapting ourselves to the new situation in which we believe (since *actions* and *beliefs* are the only possible material of any suggestion). He shows that there is nowhere a sharp line between receiving communications and receiving suggestions, just as attention shades over into neutral perception.

It is in the highest interests of psychotherapy that this intimate connection between suggestion and ordinary talk and intercourse, between suggestion and ordinary choice of motives, between suggestion and attention be steadily kept in view and that suggestion is not transformed into a kind of mysterious agency.

This discussion is most admirable. The same form of constructive procedure might very efficiently have kept out the contrasts of moral and mental, etc., criticized above, where only a *wrong method* of dealing with the contrasted matters is the issue (see also p. 374), and the contrast as such is relatively unessential.

The subconscious is done away with. Subconscious mental facts are either not mental but physiological, or mental but not subconscious. Too much emphasis is put on the

"conscious" which evidently is after all used merely as a synonym of "mental." Too little is made of the nature and mode of dissociation and the biology of dissociated complexes, to give the average reader matter for a less misleading reconstruction of what he now stores in the subconscious. With a frank acceptance of biological principles the interesting but probably somewhat bewildering discussion could be greatly simplified. When the reader has successfully divested himself of the over-emphasis of the concept of consciousness—which as we know can hardly be found discussed in modern text-books on psychology—he is again brought up to it on p. 154:

But again we have even in such most complex and exceptional cases only an alternation in the contents, not an alternation in the consciousness itself.

If consciousness denotes chiefly the mental character of the reaction, why should we go on contrasting "contents" and "consciousness"? If it designates degrees of connections, why deny the alternations? Notwithstanding these criticisms, the two chapters are a most excellent *pièce de résistance* of the book.

The second part of the book, the field of psychotherapy, its general and special methods, and the mental and bodily symptoms, is better than similar popularizations. To the physician and even more to the layman, the casuistic material brings much encouragement, but probably also a false perspective, although no doubt less so than many other attempts of propaganda. To one familiar with what has been achieved during the last twenty-five years, psychotherapy must appear rather broader than is depicted in the case-records. The book makes it a point to abstain from everything which is exceptional or even unusual; yet, it does not make plain in the cases, how much can be corrected by a simple adjustment of conduct and attitude (without hypnotism or other very specific methods); or why the method employed is necessarily cogent. After all the book claims

to sketch the whole field of disturbances in which psychotherapeutic influences might be possible and all the methods available.

There lies a great danger in such an attempt of writing popularly about a matter of action and procedure without a full discussion of the principles and factors to be handled. What should we think of a book on drug-treatment for a general public unless it analyzed the things to be treated and some indications of *why* the matter and choice of method must after all be left to the physician? Münsterberg urges that these matters be left to the physician and he even condemns the running of a "psychological clinic" by a non-medical psychologist. Why then discuss the whole procedure before the wider public?

It might be easy to misinterpret the protestations that the writer would never use hypnotism experimentally (p. 380). They tend to give an idea that there must be something wrong or dangerous or queer in it, after all, even in the hands of a competent M.D. We certainly should not hesitate to try drugs on ourselves or others to study physiological effects and especially their harmlessness. This feature of the third part of the book, and such sentences as "It is never the task of the minister to heal a mind and never the task of a physician to uplift a mind. One moves in the purposive sphere, the other in the causal sphere"—and the continual dogmatic discrimination against psychiatry in which psychotherapy (though not merely hypnotism and tricks) is daily more essential, might well be modified in further editions.

It is a pity that the book is intended to serve for propaganda to so many classes. A book frankly addressed to physicians, and another frankly addressed to the layman would have been safer and more acceptable.

ADOLF MEYER

Anwendung elementarer Mathematik auf biologische Probleme. H. PRZIBRAM. Leipzig, Engelmann. 1908. Pp. vi + 84. (Forming Heft III. of Vorträge und Aufsätze über Entwicklungsmechanik der Organismen.)

The purpose of this book is stated at the outstart by the author to be an attempt to show biologists that a mathematical treatment of biological problems may be in general valid and useful. By such demonstration it is hoped to lessen or eradicate "eine gewisse Scheu" of such methods on the part of workers in this field, which Przibram (in common with others) has observed. Both these aims are certainly commendable, and this book will undoubtedly aid—and in certain quarters perhaps greatly aid—in their realization.

The general plan of the book, which is an outgrowth of a series of lectures given in the University of Vienna, is to present first in an introductory chapter certain general considerations regarding the scope, the limitations, the necessity for and the practical usefulness of mathematical methods in biological investigation. There follows a series of chapters intended to show how the general principles brought out in the introductory chapter apply in the study of specific, concrete, biological problems. In the practical working out of this scheme it results that the introductory chapter, with the title "Möglichkeit mathematischer Biologie," is by long odds the best in the book. The arguments for the possibility, and indeed necessity, of a mathematical biology are stated very clearly, incisively and convincingly. To be sure, such arguments have been as well stated before, but it is encouraging, and augurs well for the wider acceptance of these ideas, that this time they are presented by a biologist *von Fach*, not by a mathematician.

The special chapters (II. to IX. inclusive) deal with a variety of general biological problems from the standpoint noted above. Chapter II. (Raum) discusses the interrelations between cell and nuclear volume and surface. Chapter III. (Zeit und Geschwindigkeit) deals primarily with growth and in particular with rate of growth. Chapter IV. (Energie) has as its chief topic the temperature coefficients of various biological phenomena. Gleichgewicht is the title of Chapter V. and it deals with certain quantitative as-

pects of regeneration and molting in arthropods. The next chapter has for its title Chance and for its biological topic the distribution (right or left) of asymmetry of the chelæ in certain crustacea. As a supplement to this chapter there is a brief discussion of sex as a "chance" phenomenon. Chapter VII., under the title Kombinationen, deals with the segregation and recombination of characters in Mendelian inheritance. Variation und Selektion are briefly discussed in the next chapter. Chapter IX. deals in an elementary way with psychophysics, particular attention being given to the Weber-Fechner law. A curiously ill-assorted and incomplete bibliography ends the volume. The author states in the preface that the bibliography is not complete. How superfluous this remark is is indicated, for example, by the fact that Pearson's name does not appear at all except as an associate editor of *Biometrika*, and that Weldon is known only by his 1898 British Association address. Whatever one's opinion may be as to the importance of Pearson's work, it certainly is a fact that he has contributed extensively to the subject with which this book has to do, viz., the application of elementary mathematics to biological problems. That Przibram is aware of this fact appears definitely in the text. To cite Pearson's fundamental papers in the bibliography would seem only common justice to the reader.

The discussions in these special chapters are in every case suggestive. They are, however, neither exhaustive nor thorough. But since they were obviously not intended to be they perhaps can not fairly be criticized on this ground. The greatest weakness of these chapters, to the reviewer's way of thinking, is that the standpoint is too exclusively abstract and too little concrete and *quantitative*. Biology needs definite, quantitative data bearing on its problems, much more than it does theoretical abstractions, even though these be mathematical in form. Of course it is not to be expected that measurements or statistics will be presented in a general work of this character; but it is reasonable to ask that the general

standpoint of the work give no excuse for even the most careless reader to carry away the notion that a deft manipulation of equations will *per se* ever solve a biological problem. On the whole the book is an interesting and suggestive introduction to the general subject of "mathematical biology."

RAYMOND PEARL

Archiv für Zellforschung. Herausgegeben von Dr. RICHARD GOLDSCHMIDT, München. Leipzig, Verlag von Wilhelm Engelmann.

Cytology has grown so rapidly within the last decade that it is already one of the important subdivisions of biology and the journals devoted to morphology and physiology are no longer able to provide for the publication of the constantly increasing output of research in this field. Furthermore in the study of the cell, which is the ultimate independent unit of all organic structure and function, the subdivisions of biology into botany and zoology, morphology and physiology, have less value than in the study of less general structures and functions; in the study of the cell all biological sciences come to a focus, the cytologist is not, or at least should not be, exclusively a zoologist, a botanist, a morphologist or a physiologist, but all of these combined. The scattering of cytological literature through the journals of all of these special sciences makes it much less accessible to the student of the cell and tends to emphasize distinctions which are here worse than useless. Finally the problems of cytology are of such general and fundamental interest that they well deserve and should well support special publications in this field.

Almost twenty-five years ago the late Professor Carnoy established the journal *La Cellule*, which has ever since continued to be published in beautiful and sumptuous form; from the first, however, it was devoted very largely to the work of Carnoy and his pupils and its *raison d'être* was the propagation of the views of a particular school. Of late there has been very urgent and increasing need of a general journal devoted exclusively to cytology and representing no particular

school or propaganda. Such a journal is the *Archiv für Zellforschung*, edited by Dr. Richard Goldschmidt, of Munich, and published by W. Engelmann, of Leipzig. The first number of this journal appeared in February, 1908, and the first volume, consisting of four numbers, was completed in July of the same year; a second volume has appeared since then. Each volume consists of about 600 pages and 20 lithographic double-plates, with numerous text figures. The *Archiv* receives and publishes contributions in the German, French, English and Italian languages, supplies authors with 40 separata gratis, and pays an honorarium of 40 Marks per signature of sixteen pages for contributions of not more than four signatures. In paper, typography and illustrations the new journal shows the usual German excellence, while the character of the contributions is of a very high order, as is indicated by the following lists of contents of the first volume: Richard Hertwig, "Ueber neue Probleme der Zellenlehre"; G. Tischler, "Zellstudien an sterilen Bastardpflanzen"; A. und K. E. Schreiner, "Zur Spermienbildung der Myxinoïden"; Richard Goldschmidt, "Ueber das Verhalten des Chromatins bei der Eireifung und Befruchtung des *Dicrocoelium lanceatum*"; Methodi Popoff, "Experimentelle Zellstudien"; M. G. Sykes, "Nuclear Division in *Funkia*"; J. Duesenberg, "Les divisions des Spermatoocytes chez le Rat"; Kristine Bonnevie, "Chromosomenstudien"; M. G. Sykes, "Note on the Number of the Somatic Chromosomes in *Funkia*"; Honoré Lams, "Les divisions des Spermatoocytes chez la Fourmi (*Camponotus herculeus*)"; Alfred Kühn, "Die Entwicklung der Keimzellen in der parthenogenetischen Generationen der Cladoceren *Daphnia pulex*"; Vladislav Ruzicka, "Zur Kenntnis der Natur und Bedeutung des Plastins"; R. Fick, "Zur Konjugation der Chromosomen"; Friedr. Meves, "Es gibt keine parallele Konjugation der Chromosomen!" R. Goldschmidt, "Ist eine parallele Chromosomenkonjugation bewiesen?"

The second volume is equally meritorious, and the abundance of such excellent contribu-

tions indicates how great has been the need for such a journal, and by the same showing this journal is one which no cytologist can afford to be without.

E. G. CONKLIN

BOTANICAL NOTES

CYTOLOGY, EMBRYOLOGY AND HISTOLOGY

DR. MIYAKE's studies of "The Development of Gametophytes and Embryogeny of *Cunninghamia*" (*Bot. Mag.*, March, 1908) leads him to the conclusion that there is a close affinity between this genus and *Taxodium* and *Cryptomeria*. He suggests that these genera should be placed with the Cupresseae, "and that *Sequoia* and *Sciadopitys* should each constitute a family by itself."

Helen Dorety in studying "The Embryo of *Ceratozamia*" (*Bot. Gaz.*, June, 1908) in which there is but one cotyledon, subjected the young ovules to the action of a klinostat (thus neutralizing the effect of gravitation) and found that embryos grown under these conditions developed two cotyledons. These studies are continued in a later paper, "The Seedling of *Ceratozamia*" (*Bot. Gaz.*, September, 1908).

Here may be mentioned R. J. Pool's "Histological Studies in the *Artemisia* Formation" (*Univ. Nebr. Studies*, Vol. 8, No. 4), in which further facts are recorded in regard to the relation between the physical environment of plants and their internal structure. Especial attention was given to *Artemisia tridentata*, the "sage brush" of the Rocky Mountain region, a perennial, woody xerophyte, although some attention was given to twenty-four other species of plants which occur in the formation. Eight plates, including forty-two figures, accompany the paper.

In R. H. Pond's studies of the "Emergence of Lateral Roots" (*Bot. Gaz.*, Vol. 46, pp. 410-12) the author concludes that in *Vicia faba* and *Lupinus albus* they "push out from the central cylinder mechanically, and do not have a digestive action upon the surrounding tissue."

In the same number of the *Gazette* W. H.

Brown's paper on "The Nature of the Embryo-sac of *Peperomia*" contributes additional facts to our knowledge of a genus of interesting plants. Among his results are the heterotypic division of the embryo-sac nucleus, and the mature sac with sixteen nuclei. Three fine plates add to the value of the paper.

We may note, also, Dr. Swingle's "Embryology of *Myosurus minimus*" (*Am. Nat.*, September, 1908) and L. L. Burlingame's "Staminate Cone and Male Gametophyte of *Podocarpus*" (*Bot. Gaz.*, September, 1908), both of which add somewhat to our knowledge of the plants concerned.

THE GRAPES OF NEW YORK

SOME years ago the New York Agricultural Experiment Station began the publication of a series of comprehensive treatises on the fruits of New York, the first, devoted to the apples, being the work of Professor S. A. Beach. Now we have from U. P. Hedrick and his four assistants a thick quarto volume of nearly six hundred pages, and 101 full-page color-plates. The latter are remarkably fine, and were made by a four-color process in which four photographic negatives were made of each specimen, and from these four copper plates were made, and in the printing each plate was used for one of the four colors used, viz., red, yellow, black and blue. It is by far the best work of this kind that we have seen.

The volume is of much more than horticultural interest, and will be consulted by botanists who wish to know something of the relationship of the various kinds of grapes more or less commonly grown in the northern states. There is first an interesting account of the old world grape (*Vitis vinifera*), and of the many futile attempts to introduce it into North America east of the Rocky Mountains. Then follows a similar, but longer account of the American grapes and their introduction into cultivation. The next chapter on Viticulture in New York is devoted to the practical horticultural aspects of the subject, and this is followed by one wholly botanical in which twenty-three American species are described with much particularity. References

to the literature and published accounts of each species are given with much fulness, and where the species has been brought under cultivation the history of such introduction is given. This chapter represents much prolonged and careful work on the part of the author and his assistants. The bulk of the book is taken up with descriptions of the leading varieties of American grapes, arranged in alphabetical order. The author's suggestions as to the specific origin of each variety are of interest to the botanist, who will be surprised to find that so many are of hybrid origin. In some cases the varieties are not simple hybrids, but combine the "blood" of three or even four species. On the other hand, not a few varieties are derived from a single original species. Thus the well-known "Concord" variety is considered to belong to the species *Vitis labrusca*, without any other admixture. The "Catawba" is regarded as a hybrid between *V. labrusca* and *V. vinifera* as is also the "Isabella." In order to produce the toothsome "Delaware" no less than three species have been blended, viz., *V. labrusca*, *V. bourquiniana* and *V. vinifera*.

Following this chapter is one enumerating the minor varieties of American grapes, and the volume ends with a bibliography and a good index. Altogether it is a most interesting and valuable volume for the horticulturist, while at the same time it is so well written from the scientific standpoint that it must become a valuable reference book for the botanist.

A BOTANICAL OPPORTUNITY

DURING his very active life the late Professor William A. Kellerman made large collections of plants amounting to many thousands of specimens, which are still the property of his estate. These are now for sale, and an unusual opportunity is thus opened to museums for securing a herbarium of great value. There are approximately 30,000 mounted specimens of flowering plants, with about as many more that are unmounted, and 40,000 mounted specimens of parasitic plants (fungi) and an equal number or perhaps more of unmounted specimens. Altogether there

are thus not far from sixty thousand mounted specimens, and from sixty to seventy thousand that are unmounted.

The collections are said to be in good condition, care having been taken to use the best methods for their preservation by adequate protection against dust and moisture, while insect depredations have been guarded against by poisoning and other means.

The fact that Professor Kellerman collected much of this material while making his careful studies of the harmful fungi which affect cultivated plants gives to this collection great value for the plant pathologist. It would be invaluable for any one of our more scientific experiment stations. Since many of the specimens were collected in Central America, this fact will appeal to the curators of the large herbaria connected with the great universities. In fact a considerable collection of plants like this, which represents the life-work of an active botanist, must have a high value on that account, alone, to say nothing of its value for the species represented.

Mrs. Kellerman hopes to have these collections kept together, as indeed they should be, if possible, but they will be sold separately if necessary. Here is an opportunity for some one who wishes to help botanical science in this country by the purchase of these collections for some institution. They should be kept together if possible, as the "Kellerman Herbarium," but whether kept together or merged into some larger herbarium, they should be made available for the use of botanical students. There must be many men of scientific tastes who would be glad to render a service to science by the presentation of this herbarium to the botanical department of some university or to one of our botanical gardens. The editor of these notes hopes that what is here said may suggest to some of the readers of SCIENCE a use for a few thousand dollars that will render a lasting service to American botany. Moreover, the editor will be glad to aid in bringing about such a desirable scientific benevolence.

CHARLES E. BESSEY

THE UNIVERSITY OF NEBRASKA

THE GROWTH OF NERVE FIBERS

THE view that each nerve fiber develops as an independent outgrowth from a nerve-cell, finally becoming united to other tissues (*e. g.*, muscle fibers) in the periphery of the body is associated especially with the name of His, and has been accepted by the majority of embryologists. Those who have worked at the question of nerve repair or have studied the mechanism of the regeneration of nerve fibers which leads to restoration of functions are divided into two camps; the majority hold, as Waller originally taught, that the nerve fibers grow in a distal direction from the cut stump attached to the central nervous system, ultimately finding their way into the peripheral segment. A minority of researchers hold the contrary view, namely, that restoration occurs in the peripheral segment independently of connection with the central nervous system.

Within the last year, Mr. Ross Harrison, of Yale, has demonstrated the correctness of the views of His in a very remarkable way. He has actually seen the fibers growing outwards in embryonic structures. Pieces of the primitive nervous tube which forms the central nervous system were removed from frog embryos and kept alive in a drop of lymph for a very considerable time; the cilia of the neighboring epidermic cells remained active for a week or more; embryonic mesoblastic cells in the vicinity were seen to become transformed into striated muscular fibers, and there was therefore no doubt that even under these artificial conditions—rendered necessary for microscopic purposes—life and growth were continuing. From the primitive nervous tissue, and from this alone, nerve fibers were observed growing and extending into the surrounding parts. Each fiber shows faint fibrillation, but its most remarkable feature is its enlarged end, which exhibits a continual change of form. This amoeboid movement is very active, and it results in drawing out and lengthening the fiber to which it is attached, and the length of the fiber increases at the rate of about 1 micromillimeter per minute. Those interested in this subject should refer to Mr. Harrison's last paper, published in the *Anatomical Record* (Philadelphia,

December, 1908), where they will find figures representing the growing fibers in various lengths drawn at intervals of half an hour or thereabouts.

Such observations show beyond question that the nerve fiber develops by the overflowing of protoplasm from the central cells and thus give us direct ocular evidence in favor of the view which most embryologists previously held mainly as the result of circumstantial evidence. It is not surprising to find that as this and other facts all bearing in the same direction are brought to light, the prevalent idea regarding nerve regeneration after injury follows the same lines. Indeed, the number of those who hold the so-called "autogenetic theory" of nerve regeneration is being reduced nearly to vanishing point.—*Nature*.

SPECIAL ARTICLES

HYDROGEN POLYSULPHIDE AS A REDUCING AGENT

WHEN lime and "flowers of sulphur" are boiled with water and the resulting cooled, clear solution poured into dilute hydrochloric acid, a heavy colored liquid separates. This liquid is stated by some chemists to be an impure hydrogen polysulphide, whereas others regard it as a mixture of several hydrogen polysulphides.

The substance has well-developed reducing properties and I have found that its employment in organic work appears to offer considerable advantages in many cases.

The chief merits of hydrogen polysulphide, as compared with ordinary reducing agents, are as follows: It is neutral; it may be used at the ordinary temperature, dissolved in ionizing solvents such as water or alcohol, or in nonionizing media such as carbon bisulphide. The exact quantity of hydrogen polysulphide present in any of its solutions may be determined with great ease by titration with iodine.

At the ordinary temperature, hydrogen polysulphide reduces picric acid to picramic acid. With nitrobenzene its reaction appears to be somewhat more complicated. Further work on this subject and also on the general applicability of hydrogen polysulphide as a reducing agent is being carried out in the chem-

ical laboratory of the McMaster University,
Toronto, Canada.

ALFRED TINGLE

LABORATORY OF THE CHIH LI BUREAU AND
THE IMPERIAL CHINESE PEI YANG MINT,
TIENTSIN, April 11, 1909

SOCIETIES AND ACADEMIES

THE OHIO ACADEMY OF SCIENCE

THE eighteenth annual meeting of the academy was held at Denison University, Granville, O., on November 26, 27 and 28, the president of the society, Professor Frank Carney, presiding. On Thursday evening a reception was held at the residence of President and Mrs. Emory W. Hunt, of the University, where a most enjoyable evening was passed by the considerable number of members present. Accommodations for members had been generously made by the university authorities, who had placed the dormitories at the disposal of the society. The sessions were held in Barney Memorial Hall.

The address of the president on "The Raised Beaches of the Berea, Cleveland and Euclid Quadrangles" occurred at 1:30 P.M. Friday, while in the evening, at 7:30, Professor R. S. Tarr, of Cornell University, discussed "The Glaciers of Mount St. Elias and Vicinity," giving an account of his recent trip, which was illustrated by a large number of interesting lantern slides.

A discussion of much practical importance was that on "The Preservation and Development of the Natural Resources of Ohio," the geological side of which was presented by Professor J. A. Bownocker, the forestry side by Professor W. L. Lazenby and the biological side by Professor Herbert Osborn.

The complete program of the meeting was as follows:

"Notes on *Spondylomorum quaternarium* Ehrb.," by M. E. Stickney.

"The Pteridophyte Flora of Ohio," by J. H. Schaffner.

"Injury to Trees by the Season's Drouth," by W. R. Lazenby.

"Snails Collected at Cedar Point, O., during July, 1908," by S. R. Williams and J. K. Breitenbecher.

"The Making of a Naturalist's Directory," by F. J. Hillig.

"The Occurrence of a New Species of Land Planarian in Ohio, with Notes on the Common Species, *Rhynchodemus sylvaticus* Leidy," by L. B. Walton.

"The Behavior of the Opossum (*Didelphys virginiana*)," by G. E. Coghill.

"Differentiation of the General Cutaneous and Visceral Ganglia in *Ameiurus*," by F. L. Landacre.

"Some Aspects of Amitosis in *Synchytrium*," by R. F. Griggs.

"Direction of Flow of Encephalic Fluid in *Amia calva* L.," by Chas. Brookover.

"Recent Evaporation Investigations," by J. Warren Smith.

"Adaptation in a Desert Lichen Flora," by Bruce Fink.

"Notes on the Ohio Flora," by J. H. Schaffner.

"The Laboratory Method for Beginning Students," by Maximilian Braam.

"Protective Encystment in *Phagocata gracilis*," by L. D. Peaslee.

"Cell Division in the Pollen Mother Cells of *Anthemis cotula* L.," by M. E. Stickney.

"Mitosis in *Opalina*," by M. M. Metcalf.

"A Preliminary Report on the Nuclear Divisions in the Pollen Mother Cell of *Convallaria majalis* L.," by L. W. Sauer.

"Is Synzesis an Artifact?" by J. H. Schaffner.

"A Preliminary Note on the Chondrocranium of *Eumeces*," by E. L. Rice. (Slides.)

"Notes on the Growth of the Western Catalpa (*Catalpa speciosa*)," by W. R. Lazenby.

"Faulty Specimens for Nature Study, and how Good Ones may be Prepared," by Chas. Drury.

"Cancer in Mice (*Mus musculus*)," by E. F. McCampbell.

"Relation of Rainfall to Crop Yield," by J. Warren Smith.

"Removal of the Showy Parts of Flowers as affecting Fruit and Seed Produced," by A. H. McCray.

"The Coals of the Monongahela Formations in Ohio," by J. A. Bownocker.

"Fresh Light on the Chronology of the Glacial Epoch in North America," by G. F. Wright. (Slides.)

"Glacial Erosion in the Canadian Selkirks," by L. G. Westgate. (Slides.)

"Some Effects of Glacial Erosion in the Alps," by N. M. Fenneman.

"The Raised Beaches of Lake Huron," by W. M. Gregory.

"Rock Terraces along Streams in the Vicinity of Columbus, O.," by G. D. Hubbard.

"Ecologic Notes from Beechwood Camp," by Bruce Fink.

"The Systematic Position of *Apathus elatus*," by A. H. McCray.

"Observations on the Tick, *Bryobia pretensis* Garman," by S. R. Williams.

"Occurrence of *Paragonimus westermanni* near Cincinnati, O.," by H. M. Benedict.

"Localization of the Excretory Function in *Amœba proteus*," by M. M. Metcalf and R. A. Budington.

"Evidence pointing toward a Sexual Reproduction in *Euglena*," by L. B. Walton.

"The Discomycetes of Oxford, O.," by Bruce Fink and Freda M. Detmers.

"Observations on Ohio Species of *Disonychia*," by L. L. Scott.

"Observations on Tube Making in *Tubifex*," by Cora M. Box.

"Venation of Leaves from Old and Young Plants," by H. M. Benedict.

"Some Noteworthy Species of Plants in Ohio," by O. E. Jennings.

"The Waverly Formations of East Central Kentucky," by W. C. Morse and A. F. Foerste.

"Valley Drift at St. Louisville, O.," by Howard Clark. (Slides.)

"Well Records in Licking County, O.," by Lewis Thomas.

"The Age of the Licking Narrows at Black Hand, O.," by K. F. Mather.

"Post-Glacial Erosion of Plum Creek, Oberlin, O.," by G. F. Wright.

"Glacial Deposits Southwest of Wilkins Run, O.," by Madge Mossman.

"The Teaching of Historical Geology," by L. G. Westgate.

"Preglacial Channels in the Little Miami Valley," by G. F. Wright.

"The Major Subdivisions of the Lower Silurian Strata in Ohio, with Particular Reference to the Richmond Formation recently Mapped by the Ohio Geological Survey," by A. F. Foerste and W. C. Morse.

"The Value of Geology as an Educational Discipline," by L. G. Westgate.

"A New Anthracnose of Cereals and Grasses," by A. D. Selby and T. F. Manus.

"The Reconstruction Method as Applied to Hollow Organs," by E. L. Rice.

Demonstrations

Cytological technique, by M. E. Stickney.

Charts illustrating the reaction of *Diemyctylus* embryos to tactile stimuli, by G. E. Coghill.

Slide showing emergence of the gametes (?) from the small spores arising from the repeated division of an "encysted" *Euglena*, by L. B. Walton.

The "larval" form of an interesting pauropod, *Eurypauropus spinosus* Ryder, by L. B. Walton.

Reports which were adopted were made by various committees, including that on the new constitution and by-laws. This was ordered printed in the *Proceedings* of the academy.

The society adopted resolutions expressing its sense of loss in the deaths of three members since the last annual meeting, William Ashbrook Kellerman, professor of botany at Ohio State University, Hon. Joseph Outhwaite and John J. Janney. The life of Professor Kellerman was sacrificed to science, death resulting from a tropical fever while on a collecting expedition in Guatemala, Central America. He was one of the charter members of the society and had served it as president in 1897, while rarely an annual meeting was held in which his interest was not manifested through his attendance and participation in the program. Both Mr. Outhwaite and Mr. Janney, who were also residents of Columbus, had at various times signified their interest in the affairs of the academy. Mr. Janney died at the advanced age of ninety-six years.

Resolutions were also adopted expressing the appreciation of the society for the courtesies extended by the faculty and others at Denison University, and to members of the local committee, of which Professor George F. McKibben was chairman, for their services in the interest of the academy, and furthermore thanking Mr. Emerson McMillin, of New York, for the continuation of his interest in the welfare of science. The society then adjourned.

The following officers were elected for the coming year:

President—J. H. Schaffner.

Vice-Presidents—L. G. Westgate and S. R. Williams.

Secretary—L. B. Walton.

Treasurer—J. S. Hine.

Librarian—W. C. Mills.

Executive Committee—*Ex officio*: J. H. Schaffner, Jas. S. Hine and L. B. Walton; elective: Chas. Brookover and J. Warren Smith.

Board of Trustees—W. R. Lazenby, chairman, term expires 1909; Frank Carney, term expires 1910; E. L. Rice, term expires 1911.

Publication Committee—J. C. Hambleton, term expires 1909; E. L. Rice, chairman, term expires 1910; Bruce Fink, term expires 1911.

L. B. WALTON,
Secretary